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| 10/826,970 | 04/15/2004 | Alastair M. Reed | P0976 | 1185 |

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| EXAMINER | |
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| RICE, ELISA M | |
| **ART UNIT** | **PAPER NUMBER** |
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| SHORTENED STATUTORY PERIOD OF RESPONSE | MAIL DATE | DELIVERY MODE |
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**Please find below and/or attached an Office communication concerning this application or proceeding.**

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

| Office Action Summary | Application No. 10/826,970 | Applicant(s) REED ET AL. | |
|---|---|---|---|
| | Examiner Elisa M. Rice | Art Unit 2609 | |

-- *The MAILING DATE of this communication appears on the cover sheet with the correspondence address* --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☐ Claim(s) *1-16* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-16* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *4/15/2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

## DETAILED ACTION

### *Claim Rejections - 35 USC § 101*

1. 35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

The USPTO "Interim Guidelines for Examination of Patent Applications for Patent Subject Matter Eligibility" (Official Gazette notice of 22 November 2005), Annex IV, reads as follows:

> Descriptive material can be characterized as either "functional descriptive material" or "nonfunctional descriptive material." In this context, "functional descriptive material" consists of data structures and computer programs which impart functionality when employed as a computer component. (The definition of "data structure" is "a physical or logical relationship among data elements, designed to support specific data manipulation functions." The New IEEE Standard Dictionary of Electrical and Electronics Terms 308 (5th ed. 1993).) "Nonfunctional descriptive material" includes but is not limited to music, literary works and a compilation or mere arrangement of data.
>
> When functional descriptive material is recorded on some computer-readable medium it becomes structurally and functionally interrelated to the medium and will be statutory in most cases since use of technology permits the function of the descriptive material to be realized. Compare In re Lowry, 32 F.3d 1579, 1583-84, 32 USPQ2d 1031, 1035 (Fed. Cir. 1994) (claim to data structure stored on a computer readable medium that increases computer efficiency held statutory) and Warmerdam, 33 F.3d at 1360-61, 31 USPQ2d at 1759 (claim to computer having a specific data structure stored in memory held statutory product-by-process claim) with Warmerdam, 33 F.3d at 1361, 31 USPQ2d at 1760 (claim to a data structure per se held nonstatutory).
>
> In contrast, a claimed computer-readable medium encoded with a computer program is a computer element which defines structural and functional interrelationships between the computer program and the rest of the computer which permit the computer program's functionality to be realized, and is thus statutory. See Lowry, 32 F.3d at 1583-84, 32 USPQ2d at 1035.

2. Claim 7 and 16 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter as follows. Claims 7 and 16 define a "storage medium" embodying functional descriptive material. However, the claim does not define a computer-readable medium or memory and is thus non-statutory for that reason (i.e., "When functional descriptive material is recorded on some computer-readable medium

it becomes structurally and functionally interrelated to the medium and will be statutory in most cases since use of technology permits the function of the descriptive material to be realized" – Guidelines Annex IV). That is, the scope of the presently claimed "storage medium" can range from paper on which the program is written, to a program simply contemplated and memorized by a person. The examiner suggests amending the claim to embody the program on "computer-readable medium" or equivalent in order to make the claim statutory. Any amendment to the claim should be commensurate with its corresponding disclosure.

### *Claim Rejections - 35 USC § 102*

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

4. **Claim 1-16** are rejected under 35 U.S.C. 102(b) as being anticipated by Levy (US 2001/0054150 A1).

**Regarding claim 1**, Levy discloses a method of digitally watermarking visual media comprising:

passing a reference image and a watermarked image through a model of an output device ("in this iterative approach, the embedder initially embeds the watermark payload according to the command parameters at lowest robustness and highest perceptual quality, applies a model of degradation for the particular rendering device or transmission channel to the watermarked signal," Levy, paragraph 49). The lowest robustness in this case is taken to represent the reference image and higher robustness watermark in the second iteration is the watermark image. While the word signal is used above, as stated by Levy in paragraph 4, "the invention relates to steganography, digital watermarking and data hiding within multimedia signals, including still images, audio and video."

passing the output of the model of the output device to a visual quality metric ("applies a model of degradation for the particular rendering device or transmission channel to the watermarked signal, and then decodes the watermark to measure the detection error rate for the message payload (e.g., the detection error is quantified using a measure of the difference between decoded symbols and expected symbols before error correction decoding is applied).", Levy, paragraph 49),

and using the output of the quality metric to adjust watermark embedding to achieve a desired visual quality in a watermarked image ("This type of robustness and perceptual quality specification enables the watermark embedder module to perform iterative embedding with a feedback path to optimize embedding for a particular rendering or transmission device. In this iterative approach, the embedder initially embeds the watermark payload according to the command parameters at lowest robustness and highest perceptual quality, applies a model of degradation for the particular rendering device or transmission channel to the watermarked signal, and then decodes the watermark to measure the detection error rate for the message payload (e.g., the detection error is quantified using a measure of the difference between decoded symbols and expected symbols before error correction decoding is applied). It then repeats another iteration of this process, increasing the robustness slightly with each iteration until the detection error rate is at a satisfactory level. The model of the degradation may be a compression operation, or a signal transformation that simulates the distortion due to digital to analog--and analog to digital conversion, time scaling, affine transformation, etc.", Levy, paragraph 49).

The measure of the robustness taken with each iteration is, in effect a measure of the of the visual quality or a visual quality metric because with each iteration, the visual quality is being corrected for and adjusted along with the robustness since robustness and visual quality are trade-offs of each other.

**Regarding claim 2**, Levy teaches the method of claim 1 as discussed above, wherein the visual media comprises an image to be printed and the model is a model of a printing process ("For images, the rendering process may be implemented in a display driver, printer driver, or plug-in to the display or printer driver. It may also be implemented in the printer hardware and specifically integrated into the halftoning process so that the watermark is particularly adapted to the halftone process", Levy, paragraph 54).

**Regarding claim 3**, Levy teaches the method of claim 1 wherein the visual media comprises video to be displayed and the model is a model of a display device ("Similarly, a video processor renders a video signal and embeds the watermark payload at a robustness level appropriate for the distribution, broadcast or transmission format.", Levy, paragraph 59)

**Regarding claim 4**, Levy teaches the method of claim 1 including applying the model of the output device (the model of the degradation, Levy, paragraph 49) and visual quality metric (perceptual quality parameters, Levy, paragraph 34) iteratively to adjust the watermark embedding ("It then repeats another iteration of this process, increasing the robustness slightly with each iteration until the detection error rate is at a satisfactory level. The model of the degradation may be a compression operation, or a signal transformation that simulates the distortion due to digital to analog--and analog to digital conversion, time scaling, affine transformation, etc.", Levy, paragraph 49).

**Regarding claim 5**, Levy teaches the method of claim 1 wherein the visual quality metric (parameter...such as the perceptual quality for that location, Levy, paragraph 46) is used to produce a visibility map ("For each element, the mask may be associated with other parameters, such as the payload for that location such as the perceptual quality for that location." and the visibility map is input to the watermark embedding to adjust areas of the digital watermark ("The mask may be designed by the creator of the media object to specify where to, and conversely, where not to embed the watermark, and also to specify the watermark intensity for the areas where it will be embedded.", Levy, paragraph 46) so as to compensate for an effect of the output device on visual quality of the watermarked image ("can optimize the watermark embedding for the particular rendering process or transmission channel", Levy, paragraph 61).

As watermarking is a fairly new technology area, there are very few terms that have widely accepted definitions. Mask and map are viewed as interchangeable concepts. A mask could be any array generated based on the visibility measurements that indicates how the adjustment in the embedding is to be performed. In image analysis, a mask is a two dimensional array of values used to select or designate areas of an image for processing. Thus if a mask were created from visibility measurements, and used to select areas to adjust watermark embedding, it would certainly read on the "visibility map."

**Regarding claim 6**, Levy teaches the method of claim 1 wherein the visual quality metric evaluates a watermarked image relative to an original un-watermarked image to identify areas in the watermarked image where an embedded digital watermark is more or less visible ("The perceptual quality parameters may be specified using automated measures such as peak signal to noise ratio, which quantifies the distortion of the watermarked signal relative to the un-watermarked signal. The perceptual quality parameter may be specified as an allowable range or as a threshold which should not be exceeded.", Levy, paragraph 50)

**Regarding claim 7**, Levy teaches a storage medium ("The methods and processes described above may be implemented in programs executed from a system's memory (a computer readable medium, such as an electronic, optical or magnetic storage device.", Levy, paragraph 66) on which is stored instructions for performing a method of digitally watermarking an image ("embeds the watermark in a host media signal", Levy, paragraph 6), the method comprising:

passing a reference image and a watermarked image through a model of an output device ("in this iterative approach, the embedder initially embeds the watermark payload according to the command parameters at lowest robustness and highest perceptual quality, applies a model of degradation for the particular rendering device or transmission channel to the watermarked signal," Levy, paragraph 49). The first lowest

robustness image in this case is taken to represent the reference image and the higher robustness image in the second iteration is the watermark image.

passing the output of the model of the output device to a visual quality metric;
and using the output of the quality metric to adjust watermark embedding to achieve a desired visual quality in a watermarked image ("This type of robustness and perceptual quality specification enables the watermark embedder module to perform iterative embedding with a feedback path to optimize embedding for a particular rendering or transmission device. In this iterative approach, the embedder initially embeds the watermark payload according to the command parameters at lowest robustness and highest perceptual quality, applies a model of degradation for the particular rendering device or transmission channel to the watermarked signal, and then decodes the watermark to measure the detection error rate for the message payload (e.g., the detection error is quantified using a measure of the difference between decoded symbols and expected symbols before error correction decoding is applied). It then repeats another iteration of this process, increasing the robustness slightly with each iteration until the detection error rate is at a satisfactory level. The model of the degradation may be a compression operation, or a signal transformation that simulates the distortion due to digital to analog--and analog to digital conversion, time scaling, affine transformation, etc.", Levy, paragraph 49).

The measure of the robustness taken with each iteration is, in effect, a measure of the of the visual quality or a visual quality metric because with each iteration, the visual quality is being corrected for and adjusted along with the robustness since robustness and visual quality are trade-offs of each other.

**Regarding claim 8,** Levy discloses a method of digitally watermarking visual media comprising:

passing a reference signal and a watermarked signal through a model of an output device ("in this iterative approach, the embedder initially embeds the watermark payload according to the command parameters at lowest robustness and highest perceptual quality, applies a model of degradation for the particular rendering device or transmission channel to the watermarked signal," Levy, paragraph 49). The lowest robustness in this case is taken to represent the reference signal and higher robustness watermark in the second iteration is the watermark signal.

passing the output of the model of the output device to a visual quality metric;
and using the output of the quality metric to adjust watermark embedding to achieve a desired visual quality in a watermarked signal ("This type of robustness and perceptual quality specification enables the watermark embedder module to perform iterative embedding with a feedback path to optimize embedding for a particular rendering or transmission device. In this iterative approach, the embedder initially embeds the

watermark payload according to the command parameters at lowest robustness and highest perceptual quality, applies a model of degradation for the particular rendering device or transmission channel to the watermarked signal, and then decodes the watermark to measure the detection error rate for the message payload (e.g., the detection error is quantified using a measure of the difference between decoded symbols and expected symbols before error correction decoding is applied). It then repeats another iteration of this process, increasing the robustness slightly with each iteration until the detection error rate is at a satisfactory level. The model of the degradation may be a compression operation, or a signal transformation that simulates the distortion due to digital to analog--and analog to digital conversion, time scaling, affine transformation, etc.", Levy, paragraph 49).

The measure of the robustness taken with each iteration is, in effect a measure of the of the visual quality or a visual quality metric because with each iteration, the visual quality is being corrected for and adjusted along with the robustness since robustness and visual quality are trade-offs of each other.

**Regarding claim 9**, Levy discloses the method of claim 8 wherein the model of the output device models an effect of an audio rendering process ("For images, audio and video, the rendering process is implemented in media object generation tools used to transform the signal into a format for distribution, broadcast, or transmission. In these cases, the signal transformation process selects the embedding method and

parameters that adapt the robustness of the embedded watermark and perceptual quality of the rendered watermarked signal for the particular rendering process or transmission channel. For example, an audio processor renders a music signal and embeds the watermark payload at a robustness level appropriate for the distribution, broadcast or transmission format," Levy, paragraph 59).

**Regarding claim 10**, Levy teaches the method of claim 8 wherein the model of the output device models an effect of a video rendering process. ("Similarly, a video processor renders a video signal and embeds the watermark payload at a robustness level appropriate for the distribution, broadcast or transmission format.", Levy, paragraph 59)

**Regarding claim 11**, Levy teaches the method of claim 8 as discussed above, wherein the model of the output device models an effect of a printing process ("For images, the rendering process may be implemented in a display driver, printer driver, or plug-in to the display or printer driver. It may also be implemented in the printer hardware and specifically integrated into the halftoning process so that the watermark is particularly adapted to the halftone process", Levy, paragraph 54)

**Regarding claim 12**, Levy teaches the method of claim 8 wherein the output of the quality metric ("measure the detection error rate for the message payload (e.g., the detection error is quantified using a measure of the difference between decoded

symbols and expected symbols before error correction decoding is applied)", Levy, paragraph 49) is used to adjust strength of digital watermark embedding in areas of the watermarked signal where the perceptual quality metric determines that a digital watermark is more or less perceptible than desired. ("It then repeats another iteration of this process, increasing the robustness slightly with each iteration until the detection error rate is at a satisfactory level", Levy, paragraph 49).

**Regarding claim 13**, Levy teaches the method of claim 12 wherein the adjusting is performed by providing output from the quality metric (measure of the detection error rate for the message payload, Levy, paragraph 49) to input of a digital watermark embedding process (decodes the watermark to measure the detection error rate for the message payload (e.g., the detection error is quantified using a measure of the difference between decoded symbols and expected symbols before error correction decoding is applied). It then repeats another iteration of this process, increasing the robustness slightly with each iteration until the detection error rate is at a satisfactory level. The model of the degradation may be a compression operation, or a signal transformation that simulates the distortion due to digital to analog--and analog to digital conversion, time scaling, affine transformation, etc., Levy, paragraph 49).

**Regarding claim 14**, Levy teaches the method of claim 13 including providing output from the quality metric ("measure the detection error rate for the message payload (e.g., the detection error is quantified using a measure of the difference between decoded

symbols and expected symbols before error correction decoding is applied)", Levy, paragraph 49) to the digital watermark embedding process in a visibility map ("The mask is an array of elements each corresponding to an embedding location. For each element, the mask may be associated with other parameters, such as the payload for that location, the robustness for that location, and the perceptual quality for that location.", Levy, paragraph 46) used to adjust strength of digital watermark embedding in areas of the signal ("where not to embed the watermark, and also to specify the watermark intensity for the areas where it will be embedded", Levy, paragraph 46).

As watermarking is a fairly new technology area, there are very few terms that have widely accepted definitions. Mask and map are viewed as interchangeable concepts. A mask could be any array generated based on the visibility measurements that indicateshow the adjustment in the embedding is to be performed. In image analysis, a mask is a two dimensional array of values used to select or designate areas of an image for processing. Thus if a mask were created from visibility measurements, and used to select areas to adjust watermark embedding, it would certainly read on the "visibility map."

**Regarding claim 15**, Levy teaches the method of claim 12 wherein the adjusting is performed iteratively by repeatedly applying the model of the output device ("The model of the degradation", Levy, paragraph 49) and the quality metric ("measure of the detection error rate for the message payload", Levy, paragraph 49) to watermarked

signals and using output of the quality metric to adjust the watermark embedding until a desired robustness of the watermarked signal is attained ("It then repeats another iteration of this process, increasing the robustness slightly with each iteration until the detection error rate is at a satisfactory level.", Levy, paragraph 49).

**Regarding claim 16**, Levy teaches a storage medium ("The methods and processes described above may be implemented in programs executed from a system's memory (a computer readable medium, such as an electronic, optical or magnetic storage device.", Levy, paragraph 66) on which is stored instructions for performing a method of digitally watermarking a signal ("embeds the watermark in a host media signal", Levy, paragraph 6), the method comprising:

passing a reference signal and a watermarked signal through a model of an output device ("in this iterative approach, the embedder initially embeds the watermark payload according to the command parameters at lowest robustness and highest perceptual quality, applies a model of degradation for the particular rendering device or transmission channel to the watermarked signal," Levy, paragraph 49). The first lowest robustness signal in this case is taken to represent the reference signal and higher robustness signal in the second iteration is the watermark signal.

passing the output of the model of the output device to a visual quality metric;

and using the output of the quality metric to adjust watermark embedding to achieve a desired visual quality in a watermarked signal ("This type of robustness and perceptual quality specification enables the watermark embedder module to perform iterative embedding with a feedback path to optimize embedding for a particular rendering or transmission device. In this iterative approach, the embedder initially embeds the watermark payload according to the command parameters at lowest robustness and highest perceptual quality, applies a model of degradation for the particular rendering device or transmission channel to the watermarked signal, and then decodes the watermark to measure the detection error rate for the message payload (e.g., the detection error is quantified using a measure of the difference between decoded symbols and expected symbols before error correction decoding is applied). It then repeats another iteration of this process, increasing the robustness slightly with each iteration until the detection error rate is at a satisfactory level. The model of the degradation may be a compression operation, or a signal transformation that simulates the distortion due to digital to analog--and analog to digital conversion, time scaling, affine transformation, etc.", Levy, paragraph 49).

The measure of the robustness taken with each iteration is, in effect a measure of the of the visual quality or a visual quality metric because with each iteration, the visual quality is being corrected for and adjusted along with the robustness since robustness and visual quality are trade-offs of each other.

### *Conclusion*

5. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Elisa M. Rice whose telephone number is (571)270-1580. The examiner can normally be reached on 8:00a.m.-5:30p.m. EST Monday thru Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Brian P. Werner can be reached on (571)272-7401. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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